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(54) Abstract Title
Drive mechanism for powered reciprocating tools

(57) In the case of a lifting rod for an electrical hand tool machine having a tool which may be set into a lifting motion, in particular a jig saw, for the purpose of utilizing the advantages of different geometric forms of construction to achieve a technical improvement of the electrical hand tool machine and a reduction in manufacturing costs, the lifting rod (18) is of a two-part construction and comprises a drive-side flat part (30) and a hollow round part (31) carrying the toolholder (26), wherein flat and round part (30, 31) are rigidly connected to one another.

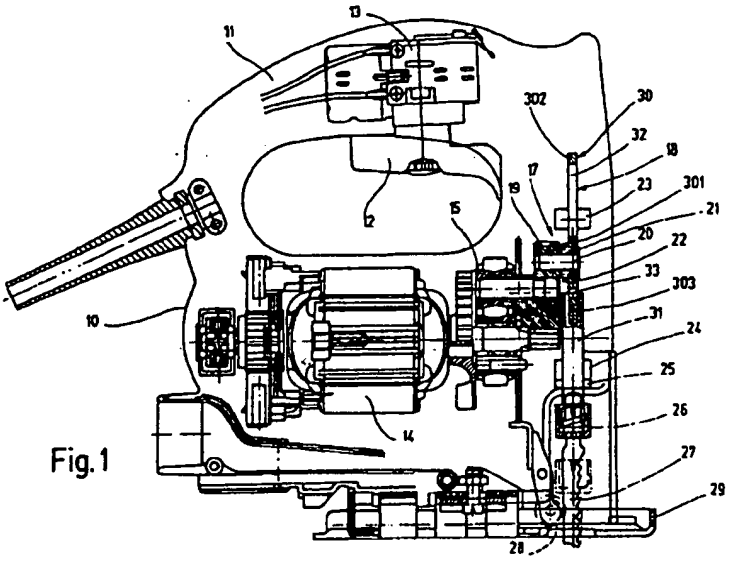

Fig.1

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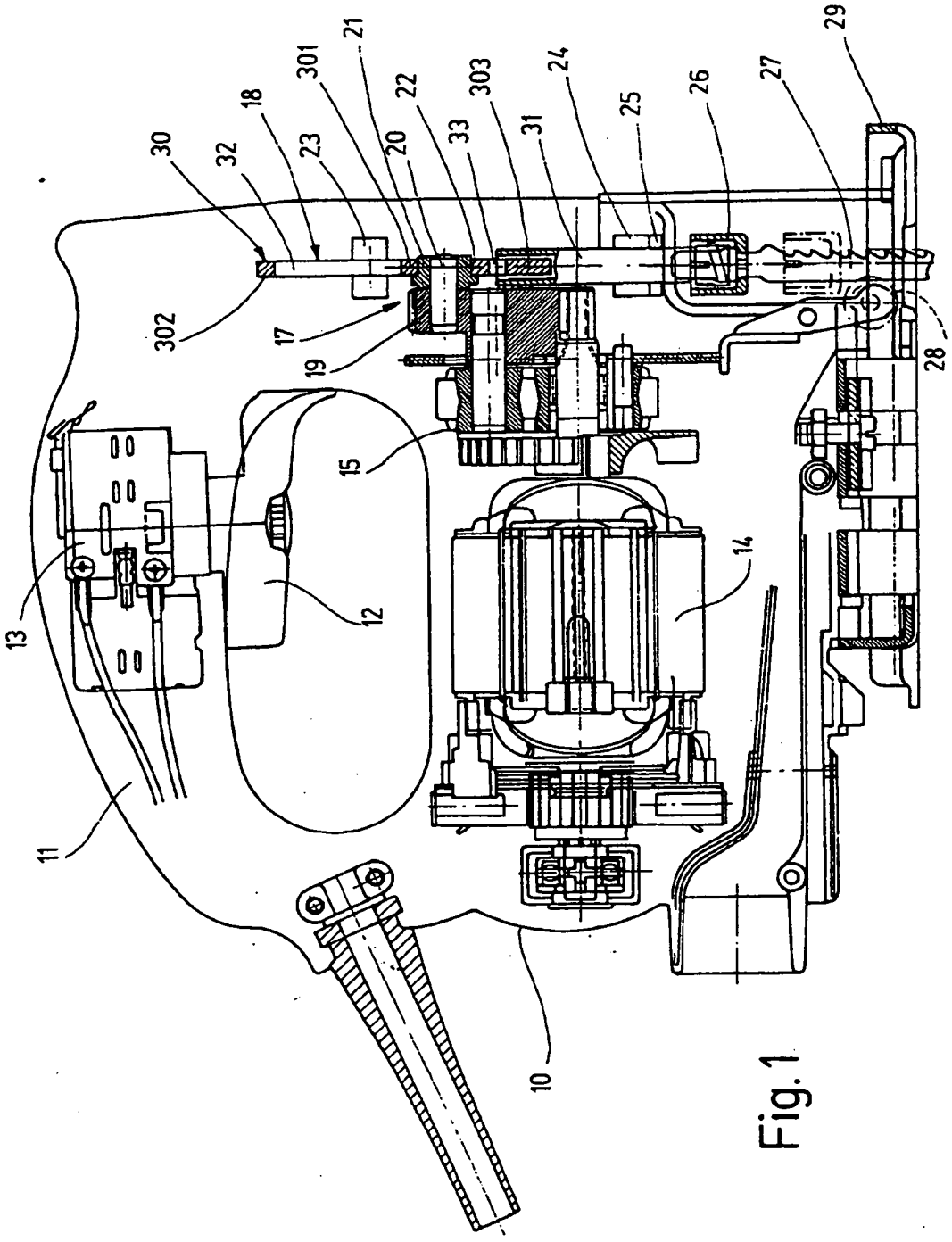
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10

Fig. 1

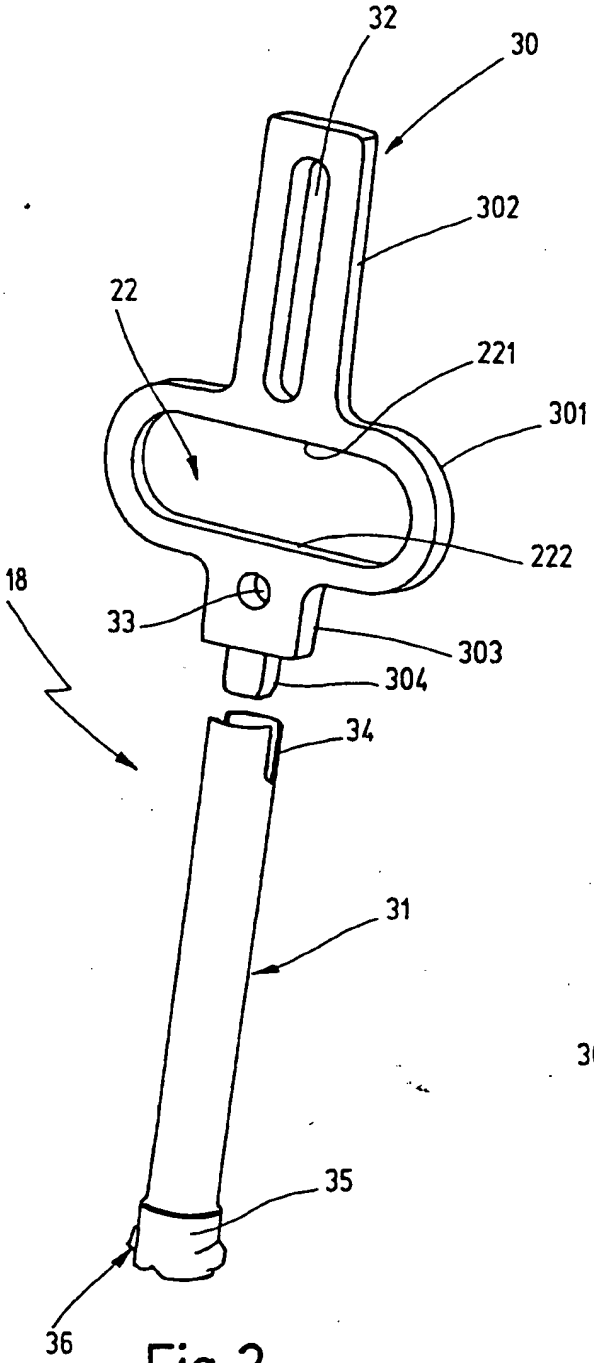
32
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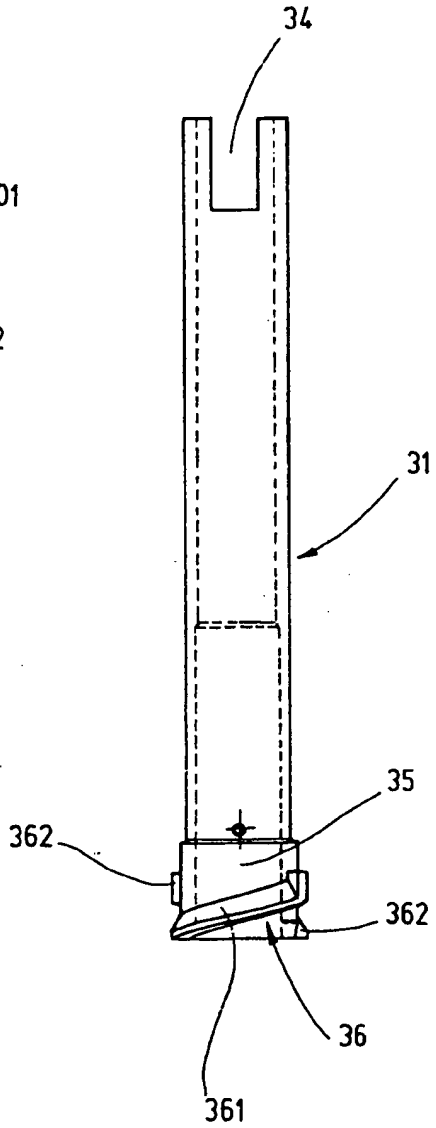
Fig. 2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31
35
362
362
36
361

Fig. 3

Lifting rod for an electrical hand tool machine

The invention proceeds from a lifting rod for an electrical hand tool machine having a tool which may be set into a lifting motion, in particular a jig saw, of the type defined in the preamble of claim 1.

In a known hand-held jig saw machine of said type (CH 434 694), the lifting rod has a rectangular cross section and is guided in an axially displaceable manner in a machine-fixed guide part. The toolholder is coupled to the lifting rod so as to be capable of swivelling in the direction of displacement of the saw blade. The saw blade is fastened exchangeably in the toolholder by means of a screw. The drive unit comprises an eccentric plate, which is drivable via a gearing by an electric motor and has an eccentric pin, which is firmly seated in an inner raceway of a ball bearing. The outer ring of the ball bearing upon rotation of the eccentric plate rolls in a box, which is open towards the eccentric plate and is in turn connected rigidly to the upper end of the lifting rod, and in so doing rests against the two box walls extending at right angles to the lifting rod.

It has already been proposed to design the lifting rod with a circular cross section and provide on its toolholder-side end an annular flange, against which the toolholder equipped with a quick-action chuck is supported. The saw blade upon clamping into the toolholder is received and automatically locked in the interior of the lifting rod and, upon release of the quick-action chuck, the saw blade is automatically ejected by means of an ejection mechanism integrated in the lifting rod. The quick-action chuck is activated during insertion of a saw blade by a lifting motion of the saw blade in the lifting rod and, in the absence of a saw blade, is held in an open position enabling introduction of a saw blade.

The lifting rod according to the invention having the features of claim 1 has the advantage of combining the advantageous properties associated with the two geometric forms of construction of the lifting rod parts to synergistic effect. The flat part is easy to manufacture and is a very inexpensive component. It enables a compact form of construction because a flat part may be moved closer to the eccentric output of the drive unit. Unlike with a round part, the axial guidance of the flat part simultaneously guarantees a locking against rotation so that an additional constructional outlay for such a locking against rotation of the lifting rod is eliminated. The hollow round part enables the receiving of the saw blade and the retention of the tried-and-tested quick-action chuck with automatic ejection function for the saw blade, wherein as a result of the possible integration of components thereof in the interior of the round part no spatial problems arise. The round part removes the need for special shapes for the bottom plain bearings of the lifting rod and of the sealing rings. To manufacture the round part, it is possible to return to the use of inexpensive manufacturing methods such as, for example, rotary kneading. Finally, the round part, which projects with its free end out of the machine housing of the electrical hand tool machine and is the only visible part of the lifting rod, lends the lifting rod an appearance which is aesthetically pleasing to the customer and, because it - unlike a flat part - gives an impression of solidity, also inspires confidence in quality.

Advantageous developments and improvements of the lifting rod indicated in claim 1 are possible by virtue of the measures described in the further claims.

According to a preferred embodiment of the invention, the free end of the round part is provided with a thickened portion and a partial thread, preferably with a lead of 7 - 8 mm, is cut into the thickened portion. There are therefore produced

at the periphery of the round part two diametrical, ascending turning paths, onto which the toolholder is screwed. Thus, it is possible to achieve a simplified assembly and a constructional simplification of the toolholder with quick-action chuck, with the result that the toolholder also is less expensive to manufacture and so the cost of producing the electrical hand tool machine as a whole may be reduced.

There now follows a detailed description of an embodiment of the invention which is illustrated in the drawings. The drawings show:

Fig. 1 a diagrammatically illustrated longitudinal section of a hand-held jig saw machine,

Fig. 2 a perspective, exploded view of a lifting rod of the hand-held jig saw machine of Fig. 1,

Fig. 3 a view, rotated through 90° compared to the view of Fig. 2, of the round part of the lifting rod.

In the hand-held jig saw machine illustrated diagrammatically in longitudinal section in Figure 1 as an example of an electrical hand tool machine having a tool which may be set into a reciprocating lifting motion, 10 denotes the machine housing and 11 denotes a handle integrally formed on the machine housing for guiding the hand-held jig saw machine. Disposed at the underside of the handle 11 is a switch button 12, which acts upon an electrical switch 13 for switching the machine on and off, the switch for said purpose being disposed in the circuit of an electric motor 14 accommodated in the machine housing 10. The electric motor

14, together with a gearing 15 and an eccentric output 16, forms a drive unit 17 which sets a lifting rod 18 into a vertical lifting motion. The eccentric output 16 comprises an eccentric plate 19, which is set in rotation by the gearing 15 and has an eccentrically disposed eccentric pin 20 projecting at right angles. A sliding block 21 is seated in a sliding but axially non-displaceable manner on the eccentric pin 20 and engages into a corresponding gate 22 in the lifting rod 18. The gate 22 is so designed that the sliding block 21 lies without play against two parallel sliding block paths extending at right angles to the lifting rod axis and along said sliding block paths a lifting motion of the lifting rod 18 is converted. The lifting rod 18 is guided in an axially displaceable manner in an upper guide 23 and in a lower guide 24 and its bottom end extends out of the machine housing 10. The exit point of the lifting rod 18 is sealed by a sealing ring 25 to prevent dust and dirt from penetrating. The lifting rod 18 carries on its free end a toolholder 26, in which a saw blade 27 is clampable. During the lift of the lifting rod 18 and saw blade 27, the back of the saw blade 27 is supported against a roller 28, which is supported against the housing. For placing the hand-held jig saw machine onto a workpiece to be sawn, there is fastened to the underside of the machine housing 10 a supporting plate 29, through which the saw blade 27 engages.

The lifting rod 18, which is shown partially in section in Fig. 1 and in a perspective view in Fig. 2, is of a two-part construction and comprises a drive-side flat part 30 and a holder-side round part 31. Flat part 30 and round part 31 are rigidly connected to one another, e.g. by welding, riveting, screwing, soldering or hammering. The flat part 30 is punched, wherein the thickness of the punched material is 3 - 4 mm. A precision blanking method is preferably used to manufacture the flat part. The hollow round part 31 is hammered, wherein imported manufacturing methods, such as e.g. rotary kneading, are employed.

Formed in the flat part 30 is a keyhole-like bow-type oval 301, which extends at right angles to the longitudinal axis of the flat part 30 and projects from either side of the flat part 30. The internal contour of the bow-type oval 301 forms the previously mentioned gate 22 of the lifting rod 18 for receiving the sliding block 21 seated on the eccentric pin 20 of the drive unit 17. The parallel sliding block paths, the distance between which is slightly greater than the diameter of the sliding block 21, are denoted by 221 and 222. The bow-type oval 301 subdivides the flat part 30 into a longer top flat part portion 302 and a shorter bottom flat part portion 303, which are each rectangular in shape. The top flat part portion 302 forms the guide part of the lifting rod 18 and slides in the upper guide 23. The bottom flat part portion 301 carries at one end an insertion stud 304 of reduced width, which is used to connect the flat part 30 to the round part 31. To reduce the weight of the flat part 30, a recess in the form of an oblong hole 32 is punched out of the top flat part portion 302 and a recess in the form of a round hole or drill hole is introduced into the bottom flat part portion 303.

The hollow round part 31, which is shown in Fig. 3 to an enlarged scale and rotated through 90° relative to the view of Fig. 2, has at its top end directed towards the flat part 30 a diametrical slot 34, into which the bottom flat part portion 303 upon insertion of its insertion stud 304 into the round part 31 positively engages in the manner evident from Fig. 1. Said positive engagement of the bottom flat part portion 303 into the slot 34 of the round part 31 results in a good stability of the connected lifting rod 18. The round part 31 at its end remote from the flat part 30 is provided with a thickened portion 35, into which a partial double thread 36 is cut. The thread 36 has a lead of 7 - 8 mm and extends only along an angle at circumference of two times 130°. The two thread sections

are denoted in Fig. 3 by 361 and 362. The thread 36 is used for screwing on the toolholder 26 in the manner shown in Fig. 1.

Claims

1. Lifting rod for an electrical hand tool machine having a tool which may be set into a lifting motion, in particular a jig saw, which lifting rod may be coupled at its one end to a drive unit (17) and carries at its other end a toolholder (26), characterized by its composition of a drive-side flat part (30) and a holder-side hollow round part (31), which are rigidly connected to one another.

2. Lifting rod according to claim 1, characterized in that the flat part is punched, preferably being manufactured by a precision blanking method, and preferably that the thickness of the punched material is 3 - 4 mm.

3. Lifting rod according to claim 1 or 2, characterized in that formed in, preferably punched out of, the flat part (30) is a gate (22) extending relative to the longitudinal axis, which is used to receive a sliding block (21) of the drive unit (17), which sliding block is disposed eccentrically on a rotatable eccentric plate (19).

4. Lifting rod according to claim 3, characterized in that the gate (22) is formed by a keyhole-like bow-type oval (301) in the flat part (30), which extends at right angles to the longitudinal axis of the flat part (30) and projects from either side of the flat part (30).

5. Lifting rod according to claim 4, characterized in that, for weight reduction purposes, recesses are provided in, preferably punched out of, the flat part portions (302, 303) remaining above and below the bow-type oval (301).

6. Lifting rod according to claim 5, characterized in that the recess in the top flat part portion (302) takes the form of an oblong hole (32) and the recess in the bottom flat part portion (303) takes the form of a round hole (33) or drill hole.

7. Lifting rod according to one of claims 1 - 6, characterized in that the round part (31) is hammered.

8. Lifting rod according to one of claims 1 - 7, characterized in that the free end of the round part (31) comprises a thickened portion (35) having a partial double thread (36) for screwing on the toolholder (36) and preferably that the thread (36) has a lead of 7 - 8 mm and is provided only along an angle at circumference of 130°.

9. Lifting rod according to one of claims 1 - 8, characterized in that the end of the round part (31) directed towards the flat part (30) has a diametrically extending slot (34) for positively receiving the flat part end.

10. Lifting rod according to one of claims 1 - 9, characterized in that the joining of flat and round part (30, 31) is effected by welding, riveting, screwing, soldering or hammering.

11. Lifting rod for an electric hand tool machine substantially as herein described with reference to the accompanying drawings.

The Patent Office

INVESTOR IN PEOPLE

Application No: GB 9909464.1 **Examiner:** Graham S. Lynch
Claims searched: 1 to 11 **Date of search:** 19 July 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): B5L LDS, LDX, L31D

Int Cl (Ed.6): B26D 1/10; B27B 19/00, 19/02, 19/04, 19/06, 19/09, 19/10, 19/12, 19/14

Other: On-line : WPI, JAPIO, EPODOC

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	US 3978862	STRYKER. Figures 1 to 3, 9, 10. Column 3, line 16 to column 4, line 23.	1, 3.

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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